

Apache Powder

Boundaries:

The site is located in Cochise County, Arizona, approximately seven miles southeast of the incorporated town of Benson and 2.5 miles southwest of the unincorporated town of St. David. The site study area covers approximately nine square miles and includes 945 acres of land owned by Apache Nitrogen Products, Inc. (ANP), formerly known as the Apache Powder Company. The San Pedro River bounds the eastern side of the site, running from the southeast corner of the property toward the northwest.

Site History:

- Apache Powder (now Apache Nitrogen Projects) began manufacturing dynamite in 1922 for mining and construction projects throughout the southwest. Later, Apache broadened its product line to include ammonium nitrate, nitrogen-based fertilizer products, blasting agents, and nitric acid. Today, Apache manufactures various forms of ammonium nitrate and nitric acid.
- Prior to 1971, manufacturing wastewater was discharged on site into dry washes which flow directly into the San Pedro River. After 1971, wastewater was discharged into unlined evaporation ponds resulting in the contamination of a perched groundwater zone. This discharge of wastewaters to the perched groundwater resulted in contamination of the shallow aquifer, as well as the San Pedro River.
- Dinitrotoluene (DNT) was used at the site during the 1950s and 1960s, and drums which contained DNT were disposed of on site.
- The Arizona Department of Health Services (ADHS) identified potential groundwater contamination problems in 1979. In 1980, EPA found high levels of heavy metals (such as lead, chromium, zinc and strontium) in some of the on-site ponds, and ten shallow aquifer wells down-gradient from Apache were found to contain nitrate at concentrations up to 470 milligrams per liter (mg/l).
- After additional studies in 1986, ADHS instructed Apache to obtain a state groundwater protection permit to address source discharges. However, Apache continued to operate in violation of applicable state water quality regulations from 1988 through 1993.
- EPA completed a preliminary investigation (PI) of the site in June 1988. This investigation confirmed the State's earlier findings of nitrate contamination, as well as heavy metals contamination of site soils.
- In 1989, Apache began supplying bottled water to nearby residents whose drinking water wells were contaminated with nitrate.
- The site was formally listed on the National Priorities List (NPL) on August 30, 1990, and EPA issued a unilateral administrative order to Apache in December 1994 to conduct remedial design/remedial action activities under CERCLA.

- In June 1992, ADEQ and EPA agreed that ADEQ would be responsible for ensuring Apache's compliance with state requirements for aquifer protection, air quality and hazardous waste management, and that EPA would be responsible for overseeing Apache's CERCLA cleanup.
- EPA completed a Baseline Public Health Evaluation and Ecological Assessment for the Apache site in September 1992.
- The Remedial Investigation (RI) and Feasibility Study (FS) were completed in June 1994. The RI revealed nitrate-nitrogen (nitrate-N) contamination in perched groundwater at the southern end of the site exceeding 1000 parts per million (ppm). Nitrate-N contamination in the shallow groundwater of the site was found at concentrations as high as 400 ppm. East of the site, concentrations of nitrate-N up to 220 ppm were detected from samples from the San Pedro River. Shallow groundwater sampling along the west bank of the river revealed nitrate-N concentrations up to 570 ppm. The federal drinking water standard for nitrate-N is ten ppm.
- In September 1994, EPA signed the Record of Decision (ROD) for the Apache Powder site. The selected groundwater remedies consisted of pumping and treating the perched groundwater zone by forced evaporation using a brine concentrator, and pumping and treating the shallow aquifer by use of constructed wetlands and then recharging the treated water back into the shallow aquifer.
- The 1994 ROD also included soil excavation, removal, and treatment at a permitted offsite disposal area, the removal and treatment of drums containing hazardous materials, and capping of any contaminated soils left on site.
- In January 1995, Apache completed construction of a brine concentrator. All discharges to the evaporation ponds have since ceased.
- In March 1995, as required by the Record of Decision (ROD), eight households that had been supplied bottled water since 1989 were hooked up to deep aquifer replacement wells.

Site Status:

Northern Area Groundwater

- In September 1997, per the ROD, construction of a 4.5-acre Northern Area Treatment Wetland to treat 150 gallons per minute (80 million gallons per year) of nitrate-N contaminated groundwater in the northern portion of the site was completed.
- From 1997 through 2001, the wetland was in its growth phase to develop its aquatic vegetation including mainly cattails. During this time enough biomass was produced to trigger anaerobic denitrification. However, operational problems during the summer of 2002 prevented full-scale startup.
- Intensified efforts to monitor the wetland and achieve full-scale startup in the summer of 2003 were developed. The 2003 startup was conducted as an EPA Treatability Study.

- In late 2004 the wetland achieved full-scale startup. During this time, the treated water was discharged to a secondary discharge location near the base of the wetland. As of March 2005, the wetland has treated over 200 million gallons of groundwater and removed over 300,000 pounds of nitrate-N.
- A short reach of the San Pedro River near Apache has unusually high nitrate concentrations. Water samples from both the river and the shallow groundwater beneath the riverbed were collected in the fall of 2001 and these samples showed nitrate-N contamination in the river of up to 52 mg/l and in the subflow of up to 400 mg/l.
- Additional monitoring wells were installed during the fall of 2002 which show that the source of nitrate-N in the river is in a shallow confined aquifer that discharges to the river.
- The extent of nitrate-N contamination in this aquifer has not yet been fully determined, but its source is thought to be the Wash 5 area of Apache's property.

Southern Area Perchlorate

- In November 1998, perchlorate contamination was detected in the Southern Area groundwater at the site ranging up to 670 parts per billion (ppb) in the perched aquifer and 300 ppb in the shallow aquifer.
- The source of perchlorate contamination is thought to be Chilean sodium nitrate that was used in historic manufacturing processes.
- The perchlorate contamination is confined to the Southern Area of the site.
- Although neither EPA nor ADEQ have a drinking water standard for perchlorate, ADHS issued a Health Based Guidance Level for perchlorate in drinking water of 14 ppb in May 2000.

Southern Area Soils and Groundwater

- Between November 1999 and June 2000, an EPA-mandated removal action of 870 tons of TNT-contaminated soils was completed. The removal action included the excavation, pre-burning, removal, and offsite disposal of these soils.
- Between December 1999 and June 2000, 262 drums (110 gallons each) containing 2,4- DNT, 2,6-DNT and vanadium-pentoxide were removed from the site. In addition, approximately 1,300 tons of soil contaminated with arsenic, DNT, and vanadium-pentoxide were excavated. These materials were transported to a permitted hazardous waste disposal facility where they were treated and disposed.
- Additional characterization of the interaction between the perched zone and shallow aquifer was conducted in the summer and fall of 2000. These investigations included construction of

additional monitor wells, exploration boreholes, groundwater modeling, and a geophysical survey.

- In 2003, a groundwater characterization report and a Supplemental Feasibility Study for the Southern Area that includes analysis of soil and groundwater remedial alternatives was completed.
- The final remedy for the perched aquifer, the Southern Area shallow aquifer, and contaminated soils in the Southern Area was specified in a ROD Amendment in September 2005. The selected remedy for the Southern Area groundwater is Monitored Natural Attenuation (MNA). The remedy for the Southern Area contaminated soils is a low-permeability native soil cover with institutional controls including a deed restriction on the southern portion of the Apache property.

Site Hydrogeology:

- The Apache Powder CERCLA site is located in the Upper San Pedro River Basin, in the Basin and Range physiographic province. The basin is bounded by several mountain ranges including the Whetstone Mountains to the west, the Dragoon Mountains to the east, the Huachuca Mountains to the southwest, and the Mule mountains to the southeast.
- The San Pedro River drains approximately 2,500 square miles, of which 700 square miles are in Mexico. The river flows northward from Mexico and joins the Gila River near Winkelman, AZ. The river is perennial where it intersects the water table, and it supports a rich riparian ecosystem.
- The Upper San Pedro River Basin is a deep alluvial-filled structural basin created by downdrop of the valley floor and uplift of the surrounding mountains. The thickness of the alluvium near the center of the basin is probably greater than 1,000 feet.
- The shallow aquifer, which occurs along the San Pedro River and its tributaries, consists primarily of unconsolidated gravel, sand, and silt deposits. It is generally 40 to 100 feet thick, and yields water easily when wells are properly constructed.
- The shallow aquifer is unconfined in most of the basin, but can be locally confined by fine-grained silt and clay deposits. Depth to water in the shallow aquifer is between 40 and 70 feet bgs.
- Separating the shallow aquifer from the deeper regional aquifer is a thick unit of clay and silt called the St. David clay. This clay unit is about 300 feet thick and is an effective aquitard that confines the groundwater in the deep regional aquifer.
- The upper portion of the deep regional aquifer is composed of clayey and silty gravel beds near the mountains, and clay, silt, and sandy silt with interbeds of gypsum near the center of the basin. The lower portion of the deep regional aquifer is composed of older sedimentary rocks including lenses of gravel, sandstone, and siltstone.

- The deep regional aquifer ranges in thickness from less than 100 feet at the basin margins to over 1,000 feet in the center of the basin.
- Wells penetrating into the deep regional aquifer exhibit artesian conditions. Some wells in the St. David area actually flow at the surface.
- At the Apache site, the shallow aquifer and the deep regional aquifer are present. In addition, there is a small perched zone on Apache's property that resulted from wastewater discharges to unlined washes and ponds.
- The perched zone drains into the shallow aquifer and is the source of nitrate and perchlorate contamination in the shallow aquifer in the Southern Area of the Apache site.
- In the Southern Area of the site, the shallow aquifer is further divided into the Molinas Creek Sub-Aquifer (thought to be a paleo-tributary channel to the ancestral San Pedro River), and the alluvial aquifer associated with the San Pedro River.
- In the Southern Area of the site, nitrate and perchlorate groundwater contamination only occurs in the Molinas Creek Sub-Aquifer, which is a confined aquifer throughout most of the Southern Area.
- The groundwater flow direction in the shallow aquifer is generally northward (sub-parallel to the river). However, the Molinas Creek Sub-Aquifer appears to flow very slowly (or not at all) due to the high evapotranspiration rate associated with dense stands of phreatophytes (mainly mesquite and cottonwood trees).
- More detailed descriptions of the hydrogeology of the Apache Powder CERCLA site can be found in reports and studies available at the Benson Public Library.

Contaminants:

The current contaminants of concern at the site include arsenic, fluoride and nitrate in the perched groundwater; nitrate in the shallow groundwater aquifer; arsenic, antimony, barium, beryllium, chromium, lead, manganese and nitrate in the inactive pond soils and sediments; and 2,4-DNT, 2,6-DNT and lead in Wash 3 Area. Additionally, the waste materials vanadium pentoxide and TNT were found in soils on the site, and perchlorate has been found in the perched and shallow aquifer. Contaminants of concern at the site may change as new data become available.

Public Health Impact:

Currently there are no known human exposures to groundwater contamination at this site. In 1995 Apache replaced a number of shallow aquifer domestic wells that had nitrate contamination with deeper regional aquifer wells and they are now supplying bottled water to two households. Perchlorate has not been detected in any domestic wells.

Community Involvement Activities:

The Environmental Protection Agency (EPA) developed and distributed the following newsletters and fact sheets: Status of Apache Cleanup Activities - May 1999, TNT Removal Action Planned for December 1999 - November 1999, Update on Cleanup at Apache – March 2004, and EPA Announces Proposed Plan (for Soil and Groundwater Cleanup in the Southern Area of the site) – July 2005. EPA and ADEQ participated in community meetings in St. David on October 14, 1999, July 19, 2005, and September 1, 2005.

Information Repositories:

Interested parties can review site information at the information repository at the Benson Public Library located at 300 South Huachuca in Benson, (520) 586- 9535. Site information is also available at both ADEQ's Southern Regional Office at 400 W. Congress, Suite 433 in Tucson, and the main office at 1110 W. Washington Street, in Phoenix. Files are available for review Monday through Friday from 8:00 a.m. to 5:00 p.m. Please call (520) 628-6715 to arrange a file review appointment at the Southern Regional Office. To arrange for a time to review the site file at the main ADEQ office, please call the ADEQ Records Center (602) 771-4378 or (800) 234-5677 (Arizona toll-free).

Contacts:

Name	Phone/Fax	E-Mail
Bill Ellett, ADEQ Project Manager	(520) 628-6714*/ (520) 628-6745	ellett.william@azdeq.gov
Andria Benner, EPA Project Manager	(415) 972-3189**/ (415) 947-3526	benner.andria@epa.gov
Vicki Rosen, EPA Community Involvement Coordinator	(415) 972-3244**/ (415) 947-3528	rosen.vicki@epa.gov

*In Arizona, but outside the Tucson area, call toll-free at (888) 271-9302.

**Call EPA's toll-free message line at (800) 231-3075.